

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION RESEARCH AND TECHNOLOGY RESUME	
TITLE Planetary Spectroscopy	
PERFORMING ORGANIZATION Lunar and Planetary Laboratory University of Arizona Tucson, AZ 85721	
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<p>DESCRIPTION (a. Brief statement on strategy of investigation; b. Progress and accomplishments of prior year; c. What will be accomplished this year, as well as how and why; and d. Summary bibliography)</p> <p>a. <u>Strategy</u>: The main goal of our research is CCD spectroscopic and imaging studies of the solar system in support of spacecraft investigations. Our studies include the physical behavior of comets, the atmospheres of the gaseous planets, and the solid surfaces of satellites and asteroids.</p> <p>b. <u>Accomplishments</u>: Our major observing program consisted of ~50 nights of photometry of Comet P/Halley in order to resolve the controversy over this comet's rotation period. This data is presently being analyzed by Dr. Mike Belton of KPNQ, who collaborated in this effort. Additional observing projects included the spectroscopic occultation of Charon by Pluto, reflection spectroscopy of Mercury (in collaboration with Dr. Neukum and S. Engel from Germany) and a spectrum of the Uranian satellite Oberon. Our Mercury data does not corroborate the Fe^{++} absorption feature reported by McCord and Clark at 8800 A but instead potentially shows a weaker feature at longer wavelengths. This position is in much closer accord with expectations for Mercury since a band center near 8800 A implies too little Fe^{++} on Mercury, especially if band shifts with temperature are considered. The Pluto project proved that the deep methane absorptions visible in their combined spectra are due solely to Pluto with Charon showing a flat and featureless spectrum. It appears that if Charon ever contained a substantial methane component, the satellite's low surface gravity could not hold it and the methane evaporated and escaped.</p> <p>c. <u>Anticipated Accomplishments</u>: The analysis of the Mercury data needs to be completed and submitted for publication. We are presently in the midst of reducing and analyzing our spectroscopy and imaging data of comet P/Halley. We have extracted spectra for the whole apparition and have emission profiles for C_2, CN, NH_2 [OI], and H_2O^+ and the dust continuum for 1985 Dec. and 1986 Jan., March and April. Our goal is to determine the spatial distribution and production rates for all of the above species over the range of heliocentric distances provided by the P/Halley apparition. The production rate ratios, compared to H_2O, can tell us the relative cometary abundances of the various species. Their behavior with heliocentric distance can yield clues on the structure of the outer layers of a comet. We have made a good start on this but because of the time-consuming nature of this analysis considerable future work remains.</p>	

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d. Publications

U. Fink, M. DiSanti, A. Schultz, "The spectral development of Comet P/Halley from 1985 August to 1986 June," *Proc. 20th ESLAB Symposium on the Exploration of Halley's Comet*, ESA SP-250, III, (Jan. 1987).

M. W. Buie and U. Fink, "Methane absorption variations in the spectrum of Pluto," *Icarus*, 70, 483-498 (1987).

U. Fink and M. DiSanti, "The separate spectra of Pluto and its satellite Charon," *Astron. J.*, 95, 229-236 (1987).

R. Marcialis and U. Fink, "Spectrophotometry of Oberon," 19th Annual DPS/AAS meeting, Pasadena, California, Nov 10-13, BAAS, 19, 819 (1987).

U. Fink and M. A. DiSanti, "The separate spectra of Pluto and its satellite Charon," 19th Annual DPS/AAS meeting, Pasadena, California, Nov 10-13, BAAS, 19, 859 (1987).

S. Engel, G. Neukum, U. Fink and A. Schultz, "preliminary results of CCD spectroscopy," 19th Annual DPS/AAS meeting, Pasadena, California, Nov 10-13, BAAS, 19, 863 (1987).

A. Schultz, U. Fink and M. DiSanti, " H_2O^+ 0, 8, 0 emission from comet Halley," 19th Annual DPS/AAS meeting, Pasadena, California, Nov 10-13, BAAS, 19, 886 (1987).

M. DiSanti, U. Fink and A. Schultz, "Spectroscopy and spatial profiles of the [OI] 6300 A emission from comet Halley," 19th Annual DPS/AAS meeting, Pasadena, California, Nov 10-13, BAAS, 19, 886 (1987).